WPS 3236

Professional Development and Incentives for Teacher Performance in Schools in Mexico

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JEL Codes: D00

Abstract

Quality of education is a determining factor in competitiveness. In order to globally compete, Mexico would have to raise its standards beyond its current low achievement. Several innovations at federal and state levels have been developed to raise the quality of basic education. One example is Carrera Magisterial (CM), which is a professional development program that was created as part of the National Agreement for the Modernization of Basic Education in 1992. This program is aimed at raising the quality of basic education through teachers' professional training, new learning presence in schools and improving working and salary conditions. This paper evaluates the impact of CM. It shows several important results. First, teacher's enrollment in the CM program has a positive impact on learning achievement. Second, family characteristics are important in explaining students' achievement. Third, investment in primary school teachers is most effective when targeted toward increasing teachers' practical experience and developing content-specific knowledge. Fourth, students in schools with a high degree of supervision on the part of the school principal achieve better scores.

World Bank Policy Research Working Paper 3236, March 2004

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*Please send your comments to gacevedo@worldbank.org. Special thanks to Vicente Paqueo, Guilherme Sedlacek, Eduardo Velez, Dulce Maria Nieto, Francisco Martinez, Daniel Lederman, Claudia Piras, William D. Savedoff, Marcelo Giugale, Kin Bing Wu, William Maloney and Laural Rawlings for valuable comments and discussion. Valuable comments were also received from the Impact and Evaluation Group, the Economic Policy Group in July 2000, the participants attending the CIDE seminar in September 2000 and the LACEA network in October 2000.

MAIN ABBREVIATIONS & ACRONYMS

ANMEB	**National Agreement for the Modernization of Basic Education** **(Acuerdo Nacional para la Modernización de la Educación Básica)**
EEEP	**The Primary Education Assessment Survey, second round 1997** **(Encuesta de Evaluación de Educación Primaria, segundo levantamiento 1997)**
INEGI	**National Institute of Statistics, Geography, and Information** **(Instituto National de Estadística, Geografía e Informática)**
SEP	**Ministry of Education** **(Secretaría de Educación Pública)**
SNTE	**National Union of Education Workers** **(Sindicato Nacional de Trabajadores de la Educación)**

1. INTRODUCTION

Good quality of education is critical in the new era of global competition and technological change. Mexico's future development depends on its ability to take advantage of new opportunities quickly and decisively. Good basic education that can be accessible to all is a necessary element for a sustainable, poverty-reducing development strategy.

This paper is part of a series that examines teachers' incentives and professional development in Mexico, in pursuit of the long-term goal of improving student learning performance.[1] The paper is divided into the following sections: the background succinctly places the objectives in context. Section 3 describes the data and methodology used in this paper. Section 4 compares school factors and management that are correlated with learning achievement in highly effective and ineffective schools. Section 5 measures the impact of school factors on learning achievement, particularly *Carrera Magisterial*, teachers' salaries and training. Section 6 offers conclusions.

2. BACKGROUND

Mexico is a federal country with a population of almost 97.4 million people spread unevenly over nearly 2 million square kilometers. About three-fourths live in urban areas. The country is relatively young—24 percent of the population is between 5-14 years old. The share of this age group in the total population is the highest among OECD countries, which have an average of about 14 percent. The pace of demographic growth has been dropping dramatically in recent times. As a result, the population under 6 years old has been decreasing at the rate of 0.5 percent a year, while the 6-14 age group has been increasing by no more than 0.1 percent a year. By the end of the century, the total number of persons in this age group will have virtually stabilized.

The structure of Mexico's educational system has the following main characteristics. Basic education is the Mexican government's highest priority. The basic education system consists of: (a) early childhood education (or pre-school), which is optional for children 3 to 5 years old; (b) mandatory primary education,

[1] Lopez-Acevedo and Salinas (2000a) Teacher's Salaries and Professional Profile in Mexico. The World Bank Mimeo. Lopez-Acevedo and Salinas (2000b) Factors that Affect Learning Achievement in Mexico: The Case of Mexico D.F., Nuevo Leon and Tabasco. The World Bank. Mimeo.

ideally from ages 6 to 12, but due to late enrollment and grade repetition targeted to ages 6 to 14, and (c) mandatory lower secondary school, consisting of a 3-year cycle, and intended for children ages 12 to 16.

The Mexican educational system has become highly centralized in the hands of the federal government. This centralization is reflected by the growing share of federal schools in total enrollment, which rose from 64 percent in 1970 to 72 percent in 1990. In May 1992, however, the states, the federal government structures, and the National Union of Workers in Education (*Sindicato Nacional de Trabajadores de la Educación*, SNTE) signed the National Agreement for the Modernization of Basic Education (*Acuerdo Nacional para la Modernización de la Educación Básica*, ANMEB). This agreement was created in response to demand for a decentralized educational system. This agreement should allow states to have more participation. Previous attempts to decentralize the educational system have failed due to constraints on the states and federal government structures and to the opposition of the SNTE. ANMEB is part of a long process that yielded satisfactory results until May 1992, when the federal government, state governors, federal agencies and the SNTE signed the agreement.

This program had three main objectives. The first was associated with the reorganization of the educational system, which consisted in the transfer of the education sector, formerly administered by the federal government, to the States. The transfer included 513,974 teachers, 116,054 administrative posts, 3,954,000 hourly salaries, 1.8 million pre-school students, 9.2 million primary students, 2.4 million secondary students, and 22 million diverse materials.

The second objective was the reformulation of regional educational content, in which states received the authority and the right to propose changes. Proposals are evaluated by SEP and, if accepted, included in the Free Textbook System (*Sistema Nacional de Libro de Texto Gratuito*). In this respect, the role of the states is to propose content, while the federal government decides and puts the proposal into practice.

The last objective, the revaluation of teaching activities, consisted in launching *Carrera Magisteria*, for basic education teachers and union members. Overall, the objective was to improve teachers' welfare through better salaries and housing policies. [2,3]

[2] The Appendix presents a detailed review of the educational decentralization process in Mexico.

[3] The ANMEB aimed at reorganizing the educational system through a process of administrative decentralization, as well as a revision of the basic educational program and the production of adequate textbooks. In accordance with this agreement, the federal government transferred the control and management of the basic education schools to the state governments. The 1992 agreement carried with it only a very limited idea of decentralization. Still, the federal government remains responsible for general policies and standards (normative and policy-making functions), teachers'

In this context, the federal government modified its educational discourse, placing more emphasis on the quality of educative content instead of the previous focus on educational coverage. As mentioned above, *Carrera Magisterial* was created as part of the ANMEB in 1992. It was aimed at raising the quality of basic education through teachers' professional training, new learning presence in schools, and improving working conditions. One component of this program is the training of teachers; another is a merit payment system in which professional staff is voluntarily evaluated and rewarded with salary increases for their performance as classroom teachers, school directors-supervisors and administrators (*tecnico-pedagogicas*). The evaluation is based on experience (10 points), professional skills (28 points), educational school level (15 points) and completion of accredited courses (17 points). In the case of teachers' performance in school, 30 points are given to student's learning achievement and professional performance.

As with principals and supervisors, 30 points are given to school performance and professional achievement. Teachers in the third area (*tercera vertiente*) obtain 30 points for educational support. All the teachers in any one of the following modalities are considered as candidates for the program: initial education, basic education, indigenous schools and lower secondary education via television (*telesecundaria)*. There are five levels of promotion ("A", "B", "C", "D", "E"). The salary rewards allocated to each represent a salary increase but do not represent a change in the type of post assigned to the teacher. The amount assigned to each of these levels is a considerable increase with respect to the number of hours worked in the initial post. According to the General Direction of Evaluation (SEP), 21 percent of a teacher's total salary at Level "A" comes from *Carrera Magisterial* program. *Carrera Magisterial* contributes 38, 51, 61 and 68 percent to a teacher at Level "B", "C", "D" or "E," respectively. The promotion ladder attaches considerable importance to seniority within this program, posts or teaching jobs in under developed areas. Once a teacher gets the *Carrera Magisterial* benefit, it is extremely rare that he/she looses it. If a teacher retires, she/he cannot be promoted within *Carrera Magisterial* unless assigned to administrative tasks (*tecnico-pedagogicas*).

The Mexican government is the predominant provider of basic educational services. It owns about 91 percent of primary and secondary schools, which account for 90 percent of the enrollment.[4] At university

formation and allocation, textbook production, evaluation and monitoring, and the provision of financial resources needed to ensure proper coverage and quality of the educational system. Moreover, federal education transfers to the states remain earmarked for specific purposes. In 1998 the government passed the 1998 Law on Fiscal Coordination, which gave the states a greater discretion in the use of federal education and other transfers.

[4] The enrollment rate for public schools is about 94 percent (primary), 93 percent (lower secondary) and 78 percent (upper secondary).

level, however, the private sector plays a much bigger role. It accounts for close to half of the enrollment (46 percent). The educational system in Mexico is now so extensive that there are over 483,000 schools (excluding preschool) staffed by over a million teachers, of which 84.3 percent are from public schools. Teachers represent 2.8 percent of the full time labor force from which only 20.1 percent are private school teachers.

In 1999, the public school teachers' share[5] was 42.82 percent of the total number of government personnel. All teachers in public basic education are affiliated with SNTE. All teachers in upper secondary and tertiary education have a union of professors and administrative workers also affiliated with SNTE or are independent (Autonomous or State Universities).

3. DATA AND METHODOLOGY

The Primary Education Assessment Survey, second round 1997 (*Encuesta de Evaluación de Educación Primaria* [EEEP]*, segundo levantamiento* 1997) from the Ministry of Education is representative by state level and by stratum (urban — public and private — schools, public rural schools, indigenous schools[6] and community schools). Students were given standardized achievement tests at the beginning of sixth grade that covered the subjects studied in the 5th grade. EEEP also collected information on schools, parents, teachers, supervisors, socioeconomic and academic backgrounds. Non-categorical are students' scores, age, amenities or facilities in the house, the number of rooms in the house, the number of teachers' updating courses, didactic material available to the teacher and school equipment. The survey design was stratified and multistage. In each stage the sample size was chosen randomly. Importantly, the final sampling unit was the school and not the student. The sample included 53,209 students and 3,645 schools. In matching students with their parents, 8,450 students were lost because their parents did not respond to the questionnaire. Another 30 percent of the sample (number of students) was also lost when matching students with their corresponding 5th grade teachers. The distribution of the scores of those students that were matched successfully suggests that there was not truncation in the sample. The Appendix shows the sample sizes by state and stratum and the list of variables employed in the analysis.

[5] Federal, state plus autonomous school teachers.
[6] The indigenous schools refers to schools offering services to populations which mother tongue is not Spanish.

In order to avoid self-selection problems derived from non-response, the sample used in the subsequent analysis was corrected with the standard Heckman's methodology. It was assumed that the three non-responding stages were independent.

Stage 1: Students' characteristics self-selection problem. The probit equation for computing the Mill's ratio was specified as follows:

Define y_i=1 if the ith student answered the questionnaire and y_i=0 otherwise. State, stratum and classroom size variables explain this probability. In order to identify the model, we used a set of geographical dummy variables at state level (trigger variable) as a measure of the differences in willingness to answer the questionnaire. The Probit estimation results are shown in Section 1 in the Appendix.

Stage 2: Parents' characteristics Self-selection problem. The probit equation for computing the Mill's ratio was specified as follows:

Define z_i=1 if the ith student's parents answered the questionnaire and z_i=0 otherwise. Geographical variables as state and stratum, as well as the classroom size and student's characteristics explain this probability. In order to identify the whole model, a set of geographical dummy variables is proposed at state level (trigger variable) as a measure of the differences in the willingness to answer the questionnaire. The probit estimation results are shown in section 1 in the annex

Stage 3: Teachers' characteristics self-selection problem. The probit equation for computing the Mill's ratio was specified as follows:

Defining x_i=1 if the ith student's teacher answered the questionnaire and x_i=0 otherwise. Geographical variables as state and stratum, as well as the classroom size, student characteristics, school characteristics, and director characteristics explain this probability. In order to identify the whole model, we propose a set of geographical dummy variables at state level (trigger variable) as a measure of the differences in the willingness to answer the questionnaire. The probit estimation results are shown in Section 1 of the Appendix.

In addition, it is possible that there is a *Carrera Magisterial* self-selection problem. The relationship observed between a student's learning and her/his teacher being in a *Carrera Magisterial* may occur because of the self-selection problem. That is, teachers who join *Carrera Magisterial* are likely to see themselves as and be highly effective teachers, so have a high probability of being rewarded. In order to avoid a possible self-selection problem, the standard Heckman's methodology was applied.

Carrera Magisterial self-selection problem. The probit equation for computing the Mill's ratio was specified as follows:

Defining v_j=1 if the jth teacher is in Carrera Magisterial and v_j=0 otherwise. Geographical variables as state and stratum, as well as classroom size, teacher characteristics and school characteristics explain this probability. "Teacher's opinion about *Carrera Magisterial* program" is proposed as the trigger variable for measuring the differences in the application of this program, which might affect the probability of participation. The probit estimation results are shown in Section 1 of the Appendix. Interestingly, the age, region, stratum, classroom size, gender, school level, experience in 5th grade, supervision and household size are important in explaining the probability of enrollment in *Carrera Magisterial*. Being female increases this probability by 14% while age and experience increase it by 5% and 4.3% respectively. Selectivity bias is significant in urban areas but not in rural areas (see the Annex).

In Section 4, the EEEP is used in order to measure the effect of school variables on a student's performance. An exploratory analysis was performed of the school variables, which are likely to constrain, empower and motivate teacher's performance. For this purpose, schools were grouped into learning achievement quintiles. In addition, compound indexes of some of these school variables were constructed. Examples of school variables used were teachers' performance, school principal's supervision, schools' facilities, directorial supervision at classroom level, teacher's training, career opportunities available to the teacher (*Carrera Magisterial*), experience, and school equipment, all by public/private institution and stratum. Section 5, which also uses the EEEP, presents the estimates of school and family effects on learning achievement by means of several multivariate models[7]. Section 6 offers conclusions.

4. THE EFFECT OF SCHOOL VARIABLES ON STUDENT PERFORMANCE: A DESCRIPTIVE ANALYSIS.

Mexican education literature is rich in ethnographic studies of schools in various parts of the country. In contrast, there are hardly any econometric studies that quantify the effects of school factors on student learning. There are some econometric studies (World Bank 1998; Lopez-Acevedo 1999) analyzing *Programa para Abatir el Rezago Educativo* (PARE) data, but they too are limited to a few states. This section presents a national/urban/rural and public/private analysis of the EEEP measuring students' performance. The purpose

[7] The methodology used for such a part is presented with more detail in section 5.

here is to test certain hypotheses regarding the determinants of student learning. These hypotheses relate to the effects of school quality, particularly the teachers' quality, training, and teaching practices. Issues regarding teachers' incentives, supervision, facilities, and specific students' characteristics and their parents' are also included in the analysis.

Based on the EEEP from SEP, Table 1 shows the distribution of Spanish and Mathematics test scores by school quintiles. The best 20% schools in the nation have a score of 57.7 on average in Mathematics (out of 100 points) and a relatively higher score in Spanish. The standard deviation is higher in this group compared to the rest of the learning achievement quintiles. The highest grade dispersions are concentrated at the tails of the distribution.

Table 1. 5th Grade Test Scores by Learning Achievement quintile

Quintile	Mathematics		Spanish	
	Mean	SD	Mean	SD
1	40.7	2.9	46.5	2.7
2	45.6	0.8	51.5	1.0
3	48.4	0.7	54.5	0.7
4	51.5	1.0	57.8	1.3
5	57.7	4.2	65.5	5.0
Total	48.7	6.1	54.9	6.8

Source: Primary Education Assessment Survey, second round 1997.

Table 2 shows the distribution of test scores nation-wide by stratum. Private urban schools perform relatively better than do other types of schools. Public urban schools rank second while indigenous schools are at the bottom of the distribution. Nonetheless, the grade differences between indigenous schools and community schools are small, particularly in Spanish scores. The highest dispersion of test scores is found in the learning of Spanish scores in private urban schools.

Table 2. Test Scores by Stratum

Stratum	Mathematics		Spanish	
	Mean	SD	Mean	SD
Community School	47.3	5.7	52.0	5.2
Indigenous School	45.8	5.4	51.5	5.1
Public rural school	48.2	6.0	54.0	6.2
Public urban school	49.4	5.9	55.6	6.3
Private urban school	53.0	6.5	62.9	8.4
National	48.7	6.1	54.9	6.8

Source: Primary Education Assessment Survey, second round 1997

Table 3 shows classroom size, which can be taken as a measure of relative school productivity among stratum. Surprisingly, indigenous schools perform better in this indicator than community schools given that the scoring difference between them is not significant. Classroom size does not differ significantly between private urban schools and public urban schools although variance is greater in the latter.

Table 3. Classroom size by Stratum

Stratum	Mean	SD
Community School	23.0	1.2
Indigenous School	22.5	8.0
Public rural school	21.5	7.1
Public urban school	24.6	3.5
Private urban school	24.3	4.5
National	22.6	6.6

Source: Primary Education Assessment Survey, second round 1997.

Tables 4-5 below show the distribution of students by learning achievement quintiles. About 45% of students in private urban schools are enrolled in the top quintile of schools, compared to only 6.4 percent of the students from indigenous schools, which has the highest percentage of students enrolled in the bottom quintile of Mexican schools. These results are more pronounced in Spanish, since 61.4 percent of the students in private urban schools are enrolled in the best 20% schools, compared to only 4.0 percent of the students from indigenous schools, which also have the largest percentage of students enrolled in the lowest 20%. The distribution of students enrolled in public urban schools is evenly distributed across quintiles. The distribution of students in public rural schools is biased toward the lowest quintile.

Table 4. 5th Grade Students Share by Mathematics Test Scores Quintiles within Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Community School	26.0	23.4	20.2	18.2	12.2	100.0
Indigenous School	33.2	26.9	20.1	13.4	6.4	100.0
Public rural school	22.5	21.4	20.1	19.1	16.9	100.0
Public urban school	15.7	18.5	20.6	23.9	21.3	100.0
Private urban school	6.4	10.2	13.6	24.4	45.3	100.0

Source: Primary Education Assessment Survey, second round 1997.

Table 5. 5th Grade Students Share by Spanish Scores Quintile within Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Community School	30.7	30.5	17.7	15.2	5.9	100.0
Indigenous School	34.8	28.8	16.7	15.7	4.0	100.0
Public rural school	22.5	24.9	18.9	20.8	12.9	100.0
Public urban school	15.4	20.8	17.5	25.6	20.8	100.0
Private urban school	4.9	6.9	6.9	19.9	61.4	100.0

Source: Primary Education Assessment Survey, second round 1997.

Tables 3, 4a, and 4b in the Appendix show the distribution of the school variables across learning achievement quintiles. An exploratory analysis identifies different factors. Quintile 1 represents ineffective schools, while quintile 5 includes effective schools. For all the school strata considered, the results indicate a strong correlation between school effectiveness and teachers' pedagogical effort, family income and level of schooling. In public rural schools, parents' expectation of a child's scholastic achievement is positively and highly correlated with learning achievement. For all public schools, the quality of educational services as perceived by the parents has a positively strong effect on achievement. Other relevant variables in public schools were teaching experience, teachers' residence in the community, teachers' training, number of students in the classroom, enrollment in *Carrera Magisterial,* parents' participation in the learning process; didactic material available to the teacher and supervision. All other variables show a weak correlation with school effectiveness.

5. TEACHERS' INCENTIVES AT THE SCHOOL LEVEL IN MULTIVARIATE MODELS.

As discussed above in the overall learning levels, the quality of basic Mexican education is low. According to the EEEP, 52.8 percent of 5th grade students are below the Spanish mean of 54.9. Just over half are also below the Mathematics mean of 48.7. Lopez-Acevedo and Salinas (2000b) show that these average

achievement rates mask disparities between states and regions. What primary school characteristics contribute the most to student learning in a multivariate model? How do these school variables impact on learning achievement? This section addresses these questions, indicating the factors that increase students' success in primary school.

The importance attributed to school factors is not unique, as school-level variables have a stronger effect on students' achievement in LDC's than in developed countries. It is clear that despite the strong contextual variables effect on primary level student achievement in Mexico, school variables are important. Thus, the identification of those school factors that lead to increase student learning is also important. Largely based on quantitative analysis of the EEEP, the impact of *Carrera Magisterial* and other important school factors on learning achievement are examined using multivariate models.

The hierarchical structure of the data, with students nested within schools, requires a form of regression analysis that weighs the sources of learning achievement variation—students, school and teachers. To analyze the determinants of learning achievement, the models below were estimated. In each model, the school, socioeconomic and teachers´ characteristics are the same. This estimation strategy allows us to measure the effect of these factors on learning achievement. The first model is the variance plus school fixed model, which is the starting point in every multilevel analysis.

The first model fully captures school effects through the use of a complete set of school dummies. The second model uses school variables (instead of dummies) to help analyze the determinants of school factors on learning achievement. Denoting child and household level variables by X, school dummies by D, and school variables by W, the models are:

$$\text{Model 1 (with geographic dummies) :} \quad y_i = \boldsymbol{\beta}'\mathbf{X_i} + \boldsymbol{\delta}'\mathbf{D_i} + \varepsilon_i \qquad (1)$$

$$\text{Model 2 (with geographic variables) :} \quad y_i = \boldsymbol{\beta}'\mathbf{X_i} + \boldsymbol{\delta}'\mathbf{W_i} + \varepsilon_i \qquad (2)$$

The two models are estimated separately for the urban and rural areas as well as nationally.

This attribute enables us to estimate the overall mean of achievement, and determine the deviations of student scores and school averages around that mean. The second model fully captures the students effects through adding student socioeconomic variables to the empty model. The third model uses school level

variables to help analyze the determinants of school effects on learning achievement. The fourth model drops the dummy variables from the third model and is estimated by ordinary least squares.

$$Y = X\beta + Z\alpha + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon$$

where,

Y Vector of individual student test scores, Mathematics or Spanish

X Matrix of student's socioeconomic background variables

Z Matrix of teacher's and school's variables

di The dummy variables that indicate schools in the sample

ε Vector of residual terms [$E(\varepsilon) = 0$ and $E(\varepsilon\varepsilon') = 0$].

(1) Model 1 (fixed effects model). The model is described by the following equation,

$$Y_{ij} = \gamma_{00} + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, Mathematics.

γ_{00} Overall mean of achievement.

di The dummy variables that indicate schools in the sample.

γ_k The deviations of achievement of the "k" school around the overall average.

ε_{ij} The deviations of students scores around the overall average.

Table 6 shows the estimates of the first model for public/private schools at national level, as well as for urban and rural areas. It can be seen in this table that the variation in mathematics test scores has an important school effect in urban/rural areas. At the national level, the total students' scores variance is 48.35, of which 51% of the variance component ratio is attributed to school-level effects.

Table 6. The Empty Model Public and Private Schools

	Public Schools			Public and Private Schools
	National	Urban	Rural	National
Total students' scores variance	48.35	56.26	46.67	48.99
Variance within the schools	23.82	24.67	23.15	24.08
Variance between the schools	24.54	31.59	23.52	24.90
Variance component ratio of school effect	0.51	0.56	0.50	0.51
Number of students	19,419	11,256	8,163	23,955
Number of schools	1,586	744	842	1,909

Source: Authors' estimates using the Primary Education Assessment, second round 1997, SEP.

(2) Model 2 with school dummies and students' characteristics:

In order to have greater precision in the estimation of the students' effects on the learning achievement, several variables were introduced at the student level, including student's gender, age, pre-school education, repetition of 5th grade, blurred vision, teacher performance, student attitude towards learning, household size, household income, household utilities, number of books in house, number of rooms in house, parent schooling level, parent expectations of student educational achievement and parent opinion of educational services in the school. The variables were entered individually to test whether the coefficients remained robust. The model is described by the following equation:

$$Y_{ij} = \gamma_{oo} + \beta_h X_{ij} + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, Mathematics.

γ_{00} Overall mean of achievement.

B_h Vector of parameters to estimate ; 1, .., H .

X_{ij} Matrix of student's socioeconomic background variables.

d_k The dummy variables that indicate schools in the sample.

γ_k The deviations of achievement of the "k" school around the overall average conditioned on students' characteristics.

ε_{ij} The deviations of students scores around the overall average.

Table 7. Model 2. Students' Characteristics

	National			Urban			Rural		
	Coeff.	S.E.	Level of Sig.	Coeff.	S.E.	Level of Sig.	Coeff.	S.E.	Level of Sig.
Student's gender (Male)	0.211	0.309	0.495	0.985	0.489	0.044	0.034	0.503	0.946
Student's age	-0.358	0.150	0.017	-0.484	0.179	0.007	-0.204	0.224	0.363
Pre-school education (Yes)	-0.069	0.279	0.805	-0.046	0.455	0.919	-0.259	0.434	0.551
Repetition in 5th grade (Yes)	-0.652	0.323	0.044	-0.204	0.370	0.581	-0.743	0.430	0.084
Blurred Vision (Yes)	-1.281	0.366	0.000	-1.301	0.560	0.020	-1.286	0.580	0.027
Teacher's performance	0.244	0.070	0.000	0.382	0.084	0.000	0.227	0.107	0.034
Student's attitude towards learning	-0.111	0.063	0.079	-0.105	0.076	0.166	-0.101	0.103	0.326
Household income	0.152	0.054	0.005	0.135	0.053	0.012	0.115	0.089	0.194
House services	0.023	0.017	0.188	0.023	0.022	0.296	-0.002	0.027	0.944
Father's schooling level	0.105	0.073	0.151	0.097	0.067	0.144	0.210	0.099	0.034
Mother's schooling level	0.121	0.065	0.062	0.127	0.065	0.052	0.081	0.111	0.466
Parent's opinion of educational services in school	0.309	0.101	0.002	0.265	0.110	0.016	0.288	0.167	0.085
Correction of self-selection bias at stage 2	8.441	13.094	0.519	-4.276	19.114	0.823	9.487	25.695	0.712
Correction of self-selection bias at stage 3	-3.689	13.007	0.777	12.644	19.728	0.522	-12.356	21.904	0.573
Constant	50.832	2.948	0.000	48.597	3.872	0.000	53.011	4.893	0.000
Total Variance	34.958			39.105			39.228		
Variance within the schools	23.408			23.479			22.563		
Variance among the schools	11.550			15.626			16.665		
Variance component ratio of school effect	0.330			0.400			0.425		
R squared (explained variance)	0.277			0.305			0.159		
Students' R squared (explained variance)	0.017			0.048			0.025		
Schools' R squared (explained variance)	0.529			0.505			0.291		
Number of Students	13,439			7,721			5,718		
Number of Schools	1,553			740			813		

Source: Authors' estimates using the Primary Education Assessment, second round 1997, SEP.

The advantage of this model is that it provides extensive information about the sources of variation that constitute the R-squared. At the national level, the student socioeconomic variables explain 27.7 percent of the total variation. This is understandable, because almost all explanatory variables are categorical. Notice that this set of socioeconomic student variables explains more than 52 percent of the variation among schools but only explains 1.7 percent of the students' variance. In urban areas, the explanatory power of the socioeconomic variables is similar to that of the national level. The introduction of these variables has several effects. It reduces in absolute terms the variance among schools (from 24.54 in model 1 to 11.55 in model 2) because individuals are less heterogeneous. The variance component ratio of school effect from model 1 to model 2 dropped by 18% percent, implying that the variance component ratio of student effect increased by 69%. Thus, schools appear to be more similar (homogenous) considering students' characteristics, but the differences among schools (heterogeneity) remain relatively important. The explanatory power of the student

variables is much lower for rural areas than for urban areas. These variables explain only 29.1 percent of the total school variance and 2.5 percent of the student variance.

This analysis also weighed student socioeconomic profile. Males and females achieve equally in mathematics. Age and grade repetition have a significantly negative impact on mathematics achievement. These students achieve lower grades than do others. Repetition has been associated with low achievement and school dropout (Lopez-Acevedo, 1997). Pre-primary school level is not significant for mathematics test scores, possibly because parents infrequently participate in their children's learning achievement. Additional work is needed to establish the links between initial education, parents' participation and learning achievement. Nonetheless, the results show that the development of self-driven and studious students who seek information beyond textbooks is a key factor in increased learning achievement. How to develop good learning habits and motivation among students should be a challenge not only to teachers but also to parents. Blurred vision has a large negative impact on achievement, which has been consistently strong thorough all estimations. Vision problems increase rapidly with age.

Teacher's pedagogical behavior (efforts and performance in the classroom) is of great importance in grading learning achievement. The impact of this variable is many times larger than the impact of other school factors, such as didactic material available to the teacher. Students learn better when they are taught by teachers who teach clearly (that is, explain concepts clearly), who have a thorough knowledge of the subject matter and who are able to intelligently handle students' questions and doubts. Although some individual teachers have introduced more interactive practices, the majority continue to use traditional, instructor-centered approaches. No general tradition exists in Mexico for encouraging active learning, managing group work, developing locally relevant materials, or adapting lessons to teach problem-solving. The quality of teachers' assessments of student progress appears inadequate, and teacher responses to students' questions are also.

Students in households with higher per capita income or family assets achieve higher scores. In addition, there is a strong positive relationship between mother's schooling level and children learning achievement in urban areas and, conversely, father's schooling level and student achievement in rural areas. The quality of educational services, as perceived by the parents, has a considerable positive impact on learning achievement.

(3) Model 3 (with student's socioeconomic index, and school and dummy variables).

To estimate the impact of school variables on student achievement scores, conditional upon the socioeconomic student's profile, a socioeconomic student index was constructed by means of principal component analysis. In order to do this, we assumed (as suspected) that student's age, repetition in 5th grade, blurred vision, student's household income, mother's schooling level, and father's schooling level were related to each other. Once this index is estimated, we introduce it into the regression model as an additional explanatory variable. Accordingly, model 3 is described by the following equation:

$$Y_{ij} = \gamma_{oo} + \beta\ I_i + \alpha_m Z_j + d_1\gamma_1 + d_2\gamma_2 + \ldots + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, Mathematics.

γ_{00} Overall mean of achievement.

B Parameter to estimate

α_m Vector of parameters to estimate; 1, …, M.

I_i Vector of student's socioeconomic index.

Z_j Matrix of schools variables.

d_k The dummy variables that indicate schools in the sample.

ε_{ij} The deviations of students scores around the overall average.

Table 8 presents estimation of model 3 at the national level. Table 5 in the Appendix presents the estimations for rural and urban areas[8]. As in model 2, the variables were entered individually to test whether the coefficients remained robust.

[8] In order to measure the academic achievement of students, socioeconomic variables, teacher and school variables have to be taken into account, since students are grouped in classrooms, which are grouped in a particular school. Within a school, this provides different educational experiences and determines specific characteristics for students as a group, depending on the class they are in. At the school level, differences can be even more striking. For example, the environment in a private school is different from that of a state owned school. This variable grouping limits the usefulness of traditional statistical analysis, Ordinary Least Square analysis gives equal weight to each observation and, as shown in various studies in which observations are grouped in levels, the assumption gives us biased estimates.

Table 8. Determinants of Mathematics Achievement Scores in 5th grade at National Level

	Public and Private Schools			Public Schools		
	Coeff.	**Level of Sig.**	**Elasticity**	**Coeff.**	**Level of Sig.**	**Elasticity**
Student Socioeconomic Index	0.485	0.000		0.485	0.000	
Teacher's gender (Male)	-0.675	0.023	-0.0072	-0.916	0.015	-0.0103
Teacher's age	0.190	0.095	0.0183	0.280	0.070	0.0270
Attendance to updating courses (Yes)	-0.931	0.074	-0.0171	0.416	0.476	0.0077
Teacher's residence within the community (Yes)	-0.052	0.890	-0.0004	-0.102	0.801	-0.0008
Teacher's years of residence in the community	0.240	0.027	0.0261	0.135	0.261	0.0148
Teacher's schooling level	0.139	0.294	0.0103	0.219	0.183	0.0163
Teacher's pedagogical behavior	0.053	0.034	0.0052	0.194	0.015	0.0041
Teacher's interest in students' learning	0.288	0.023	0.0098	0.092	0.003	0.0031
Number of updating courses	0.028	0.584	0.0030	0.021	0.709	0.0023
Type of post. Short term (Yes)	-1.210	0.030	-0.0013	-1.177	0.014	-0.0013
More than one post (Yes)	-0.004	0.990	0.0000	0.304	0.395	0.0014
Teacher's income	0.135	0.225	0.0097	0.094	0.475	0.0069
Didactic material available to the teacher	0.011	0.608	0.0033	-0.004	0.878	-0.0011
Number of supervisor visits (as Director's answer)	5.523	0.000	0.0754	5.484	0.000	0.0780
Teacher's enrollment in Carrera Magisterial (Yes)				1.436	0.003	0.0187
Carrera Magisterial level				-0.413	0.056	-0.0072
Correction of self-selection bias at stage 2	6.886	0.222		8.146	0.154	
Correction of self-selection bias at stage 3	-9.769	0.054		-12.472	0.014	
Correction of self-selection bias in Carrera Magisterial				1.674	0.182	
Constant	45.854	0.000		44.873	0.000	
R^2			0.388			0.377
Number of Students			14847			13,767
Number of Schools			1718			1602

Source: Authors' estimates using the Primary Education Assessment, second round 1997, SEP. n.a. Not applicable.

General Results

In general, students with teachers that have more years of experience (using age as a proxy) achieve higher scores in Mathematics. It is clear that teacher experience and seniority improve student achievement growth rates, suggesting that teacher proficiency is enhanced by practical experience and training. The marginal productivity of time spent in formal education of teachers on teacher effectiveness is statistically insignificant. But the potential of training to contribute to the improvement of teaching effectiveness appears high. The following findings show: the importance of teachers' experience and practice; teacher ability to deal with children's questions and doubts intelligently (implying the importance of teachers' subject matter knowledge), and teacher effectiveness in monitoring students' performance or difficulties and talking to students.

Female teachers increase learning achievement. Interestingly, training (measured by the number of courses taken by the teacher) has not impacted student achievement. Moreover, each one of these courses separately failed to have an impact on learning achievement. Thus, investment in primary school teachers seems most effective when targeted towards increasing practical experience and developing content-specific knowledge.

Teacher's years of residence in the community increases student's achievement, possibly because of the teacher's involvement with the community. Type of post (permanent or short-term) negatively impacts learning achievement. A possible explanation is that in public schools, a temporary post has almost the same benefits as a regular or permanent post. It is extremely rare to find a case where an individual had to leave his job because his "short-term post" was not renewed or because it was not changed to a long-term post. For practical purposes, "short-term post" does not mean that the teacher has to go through a probation period. This system of posting and assignments generates a conflict within learning.

Teacher's years of schooling failed to demonstrate significant effects on student learning, which is expected since there is little variance in the level of schooling. A teacher's income has no significant effect on learning achievement, but many studies have found that teacher's salary is a poor predictor of a student's achievement.

Frontline educators feel that problems relating to school infrastructure and facilities negatively affect teaching effectiveness and student learning achievement. Their foremost recommendation for raising school quality is to address this inadequacy. To what extent this recommendation will actually lead to student learning achievement is questionable. Some studies in other countries show that improvement in school infrastructure can have a significant positive impact on student learning. Mexican data do not appear to support this hypothesis.

Teacher's pedagogical efforts show a positive and significant marginal effect on learning achievement. Pedagogical effort and teacher answers to student questions are highly correlated with greater learning achievement. Other work or secondary activity does not effect a student's test scores, possibly because only a small proportion of 5^{th} grade teachers have a secondary occupation. A large number of public school teachers, however, have two or more posts. As part of ANMEB, teachers have at least two posts, one at the primary school level and another at the lower secondary school level. Didactic materials available to the teacher and school facilities failed to demonstrate a significant effect on learning achievement.

An additional important variable to explain learning achievement in public schools was school supervision by the principal and supervisor. The frequency of supervisors' school visits has a significant and positive correlation with student learning. It is also consistent with the PARE experience, which indicates that the quality of supervisors and their frequency of school visits had significant and positive effects on student test scores (World Bank 1998). The type of post assigned to the teacher (short and long term) has a negative impact on learning achievement (mathematics test scores), particularly in urban areas. Students in schools with a high degree of supervision on the part of the school principal achieve better scores. Thus, differences in school organization and management could be important for student achievement. In this study it was found that the availability and maintenance of school facilities have a very modest impact on learning achievement.

Additionally, the impacts of each explanatory variable in elasticity terms were computed in order to compare the quantitative effects among all explanatory variables. As can be seen in Table 8, variables with the highest elasticity values include supervision, teacher's enrollment in *Carrera Magisterial* and teacher's interest in students' learning.

Carrera Magisterial

Carrera Magisterial was aimed at raising the quality of basic education through teachers' career development, presence in schools, and working conditions. This program represents an effort on the part of the government to provide better support for and recognition of the valuable work of teachers.[9]

Results from the multivariate regression model show that at the national level and particularly in rural areas, enrollment in *Carrera Magisterial* positively impacts learning achievement. Notice that being in the *Carrera Magisterial* program increases a students achievement in mathematics by 1.87 percent (3.31 percent in rural areas—see Table 5 in annex). However, the level in *Carrera Magisterial* is negatively correlated with learning achievement. Ultimately, the program may have good components that promote better teaching practices, but there is a pervasive incentive affecting teacher promotion. Results show that a large share of the teachers in basic education are relatively old and work in administrative tasks.

[9] The *Carrera Magisterial* Program, which contains several parts, is governed by the Comisión Nacional Mixta consisting of officials of the SEP and SNTE.

The EEEP shows that 62.8 percent of the teachers in the sample are enrolled in *Carrera Magisterial*. In addition, there is no significant difference in test score distribution between students with a teacher in *Carrera Magisterial* and students without such a teacher.

Table 9. Teachers' Share in *Carrera Magisterial* in 5th grade

Carrera Magisterial	Number of Teachers	Share
Yes	2420	62.8
Not	1139	29.6
No answer	292	7.6
Total	3851	100.0

Source: Primary Education Assessment Survey, second round. 1997

Non-weighted data

Tables 10 and 11 present the distribution of test scores for those students in *Carrera Magisterial* and those with a teacher not enrolled in *Carrera Magisterial*, nationally and by stratum. Since there is no significant difference, one might infer that there is no selection bias with teachers in *Carrera Magisterial* getting the best students and other teachers getting worse students.

Table 10. Test Scores of Students with a Teacher in *Carrera Magisterial*

	Number of students in the sample			Test Scores					
				Mathematics			Spanish		
	Number	Share	Share of students with Identified Teachers	Mean	Median	SD	Mean	Median	SD
In *Carrera Magisterial*	19029	35.8	70.9	49.0	48.6	6.1	55.1	54.4	6.3
Not in *Carrera Magisterial*	7804	14.7	29.1	48.5	47.8	6.5	55.1	54.1	7.4
Not Identified*	26376	49.6		48.6	48.1	6.0	54.8	54.1	6.8
Total	53209	100.0	100.0						

Source: Primary Education Assessment Survey, second round 1997.

* "Not Identified" refers to those teachers who could not be matched to their respective students.

Table 11. Test Scores by Teacher's *Carrera Magisterial* Status by stratum

Stratum		Teacher is enrolled in *Carrera Magisterial*	Teacher is not enrolled In *Carrera Magisterial*	Teacher not identified
Community School	Mean			47.3
	Median			47.2
	SD			5.7
Indigenous School	Mean	45.6	45.7	46.0
	Median	45.5	45.5	46.3
	SD	5.4	5.6	5.3
Public rural school	Mean	48.4	47.9	48.1
	Median	47.8	47.8	47.8
	SD	6.2	6.2	5.8
Public urban school	Mean	49.7	49.9	49.0
	Median	49.2	49.2	49.2
	SD	5.9	6.9	5.6

Source: Primary Education Assessment Survey, second round 1997.

* "Teacher not identified" refers to those teachers who could not be matched to their respective students.

Students in rural schools with a teacher in *Carrera Magisterial* achieve slightly better scores than their peers (Table 11). In public urban schools, there is no significant difference as there is in the case of indigenous schools. Few teachers in private urban schools report being enrolled in *Carrera Magisterial*. This could be a result of a sampling error, or because a teacher works at both public and private schools.

5. CONCLUSIONS

This study is the first to link family background, teacher profile, and schools characteristics to student achievement. In the analysis of comparing high effective schools versus low effective schools, the main findings were: Private urban schools have a relatively better performance than do other types of schools. Public urban schools rank second, while indigenous schools are at the bottom of the distribution. Student enrollment in public urban schools is evenly distributed across quintiles. The distribution of students in public rural schools is biased towards the lowest 20 percent of schools. For all school strata, the results indicate a strong correlation between school effectiveness and teachers' pedagogical effort, family income and level of schooling. Other relevant variables in public schools were teaching experience; teachers' residence in the community; teachers' training as measured by content of the course taken; the number of students in the classroom; enrollment in *Carrera Magisterial*; parents' participation in the learning process; didactic material available to the teacher and supervision. All other variables show a weak correlation with school effectiveness.

Multilevel analysis showed that variation in mathematics test scores has a significant effect for all geographical levels. Additionally, national level student socioeconomic variables explain 27.7 percent of the total variation. Whereas this set of variables explains more than 52 percent of the variation among schools, it explains only 1.7 percent of the student-level variation. For urban areas, the power of explanation of these variables is similar to the power for national level areas. On the other hand, the predictive power of these variables is much lower for rural areas. The school level variation in the outcome scores reflects the socioeconomic student variables to an important extent. However, some of the remaining within-school variation might be explained by other explanatory variables. Another remarkable result is that although the

inclusion of student variables significantly reduces the variance component ratio of schooling, this ratio remains relatively important.

As expected, family background factors are important in student achievement. The quality of educational services, as perceived by the parents, has a considerably positive impact on learning achievement. Another important result is that blurred vision has a large negative impact on achievement, which is consistently strong throughout all estimations.

In the third model, type of post (permanent or short-term) has a negative impact on learning achievement. Teacher's years of schooling and income failed to demonstrate significant effects on student learning. Teacher's pedagogical efforts show a positive and significant marginal effect on learning achievement. Pedagogical effort and teacher answers to student questions are highly correlated with greater learning achievement. Didactic materials available to the teachers and school facilities failed to demonstrate a significant effect on learning achievement. Another striking result is that the teacher's enrollment in *Carrera Magisterial* has a positive relationship with learning achievement; however, the higher the level reached by the teacher in this program, the lower the student's learning achievement becomes, particularly in rural areas. In addition, students in schools with a high degree of supervision on the part of the school principal achieve better scores.

Policy implications

- The family background factors are not merely important in explaining student enrollment, but are also important in determining the student's achievement. **The importance of these demand factors brings out the relevance of targeted social programs such as PROGRESA, which not only may have an impact on enrollment but may also influence students' achievement through affecting the family socioeconomic level.**
- Blurred vision has a very significant negative impact on students' achievement. **Accordingly, it will be very important to expand the eyeglasses program throughout basic educational system and to make this program permanent.**

- Training, as measured by the number of courses taken by the teacher, does not significantly impact student achievement. Moreover, each one of these courses separately failed to have an impact on learning achievement. **Thus, investment in primary school teachers seems most effective when it is targeted to increasing practical experience and developing content-specific knowledge.**
- The type of post (permanent or short-term) has a negative impact on learning achievement. A possible explanation is that in public schools a temporary post (short-term) has almost the same benefits as a regular or permanent post. For practical purposes, "short-term post" does not mean that the teacher has to go through a probation period. Thus, it creates a pervasive relationship in the system of posts and assignments that have a conflict with learning. **Therefore, a review of the rules for defining this kind of post needs to be done in order to provide the right signals to the short-term teachers.**
- Teacher's enrollment in *Carrera Magisterial* has a positive relation with learning achievement; however, the level in *Carrera Magisterial* is negatively correlated with the student's learning achievement. The bottom line is that the program might have some good aspects that possibly promote better teaching practices but there is a pervasive incentive as to how the teacher is promoted. Additionally, the results show that a large share of the teachers in basic education are relatively old and working in administrative tasks**. Accordingly, *Carrera Magisterial's* criteria for assignment to a level must be revised in order to avoid perverse incentives. Another important issue in this regard is to eliminate the *Carrera Magisterial* option, namely *Tercera Vertiente* (Pedagogical Technician, *Técnico pedagogico*), which is likely to increase such perverse incentives.**
- Students in schools with a high degree of supervision on the part of the school principal achieve better scores. **Indicators of organizational and management differences among schools need to be implemented in order to evaluate how those schools' organization (with a high degree of supervision) affects students achievement.**

Future research

- Pre-primary school level is not significant for mathematics test scores. However, additional work is needed to establish the linkage between initial education, parent participation and learning achievement. Nonetheless, results show that the development of self-driven and studious students, who seek

information beyond their textbooks, is a key factor in increased learning achievement. How to develop good learning habits and motivation among students should be a challenge not only to teachers but also to parents.

- CM's assessment should not be made only on the basis of whether it helps to provide better pay for good teachers and retain them, but also on whether it pushes bad teachers to improve. Testing this assessment will require a panel data of teachers.
- Linking teachers' pay to the rate of growth (not the level) in their students' grades in standardized tests would require a panel of students. Lopez-Acevedo (1997) shows that teachers' salary is weakly correlated to changes in learning achievement.

APPENDIX I

The National Agreement for the Modernization of Basic Education

The decentralization process intended to create a state agency that would receive all the federal resources. In previous efforts to decentralize the educational system, the Federal Government through SEP established state delegations that were in charge of some administrative functions. These units were in charge of the reception of the federal educational system. Gradually, the delegations gained new responsibilities and administrative power that facilitated the negotiation of the ANMEB with the States and the SNTE. These delegations created a new political setting where state union leaders and teachers started to gain power and, as a result of political negotiations, allowed entry of many new parties. This participation and internal struggles in the SNTE weakened the rigid structure that opposed the previous decentralization programs. Each state had a different situation before and after the agreement, as we can see in the next table:

BEFORE THE NATIONAL AGREEMENT		AFTER THE NATIONAL AGREEMENT	
AGUASCALIENTES CAMPECHE GUERRERO HIDALGO MORELOS OAXACA QUERETARO QUINTANA ROO TAMAULIPAS	INEXISTENT STATE SYSTEM OR HIGHLY UNDERDEVELOPED	AGUASCALIENTES CAMPECHE GUERRERO HIDALGO MORELOS OAXACA QUERETARO QUINTANA ROO TAMAULIPAS	CREATION OF A DECENTRALIZED STATE ORGANISM *(Institute)*
BAJA CALIFORNIA SUR MICHOACAN TABASCO		BAJA CALIFORNIA SUR MICHOACAN TABASCO	STATE MINISTRY OF EDUCATION
COAHUILA COLIMA CHIAPAS CHIHUAHUA DURANGO GUANAJUATO NAYARIT PUEBLA SAN LUIS POTOSI SONORA TLAXCALA ZACATECAS	COEXISTENCE OF ORGANISMS WITH THE DOMINANCE OF THE FEDERAL SYSTEM	COAHUILA COLIMA CHIAPAS CHIHUAHUA DURANGO GUANAJUATO NAYARIT PUEBLA SAN LUIS POTOSI SONORA TLAXCALA ZACATECAS	COEXISTENCE OF THE MINISTRY AND THE DECENTRALIZED ORGANISM (With dominance of the ministry over the institute)
YUCATAN		YUCATAN	Fusion
BAJA CALIFORNIA JALISCO MEXICO NUEVO LEON SINALOA	COEXISTENCE WITH AN EQUALIZED STATUS	BAJA CALIFORNIA JALISCO MEXICO NUEVO LEON SINALOA	COXISTENCE OF THE MINISTRY AND A DECENTRALIZED ORGANISM (With dominance of the Institute over the Ministry)
VERACRUZ		VERACRUZ	Fusion

This table shows that the states have responded in different ways to the decentralization process, making it easier or harder, depending on their abilites to absorb their new functions and responsibilities. The

coexistence of different agencies makes the process harder because sometimes teachers belong to different sections of the SNTE, and each struggles to control the teaching posts in the new state educational agencies. Another problem was the equalization of social benefits, because there are differences among the states and federal levels that made it almost impossible for the government to cover such differences. The delegation and reception of responsibilities were as follows:

Responsibilities of the Federal Government after the ANMEB

- Operative: Provide educational services in the Federal District.
- Normative: Elaborate the legal framework that rules the basic educational system.
- Administrative: Transfer of the basic educational system to the states and setting up the agreements.
- Financial: provide compensatory expenditures (the latter through federal agencies like CONAFE) to the most underdeveloped regions to eliminate inequities between states and regions.
- Evaluative: Establish the evaluation procedures for the national educational system.
- Formulative: Plans for the educational system, authorization and periodic revision of the free textbooks.
- Financial: Allocate fiscal resources among the states through federal transfers.
- Precautionary: Supervise the proper use of the resources allocated to the states in cooperation with state agencies.

Responsibilities of the State Governments after the ANMEB

- Operative: Directly provide the educational service.
- Normative: Guarantee labor rights and social benefits to the transferred workers. To issue state educational laws.
- Administrative: Create public organisms for receiving the transferred system and integrate both systems into a single agency. Establish agreements.
- Financial: Allocate increasing resources in real terms to basic education.
- Evaluative: Design a state evaluation system.
- Formulative: Propose regional contents for the programs in basic education.

Responsibilities for Municipalities after ANMEB

- Operative: Promote and provide educational services within territories.
- Administrative: Establish agreements to coordinate or unify educational services.
- Financial: Provide resources for the school maintenance and equipment.

TAX COLLECTION AND DISTRIBUTION OF FUNDS

In order to maintain the new responsibilities of states in the administration of the educational system, it was necessary to complement the ANMEB with the transfer of resources that could make those objectives feasible. Despite its strategic importance, the transfer of resources has not always been clear and has had different impacts on each state.

Certain states complain because of they contribute more to the federal government than they receive from it. Furthermore, the levels of government also include municipalities, which have different attributes and obligations, making it difficult to establish rights on the use and collection of taxes.

In Mexico, the tax collection scheme follows these rules:

The federal government is solely responsible for the collection of the following taxes:

ISR (Tax on rents); Tax on assets; IVA (Tax on consumption); IEPS (Special taxes on production and services), and taxes on exports and imports.

The States are responsible for the collection of:

Taxes on the use of vehicles; Taxes on patrimonial transference (inheritances); Taxes on notaries and judicial business; Taxes on Transactions not subject to IVA; Taxes on public shows; and, Taxes on payrolls.

Municipalities are responsible for the collection of:

Prevail (a property tax) and Taxes on public services (garbage collection, sewage, water, etc.).

The Law of Fiscal Coordination, in which the Ministry of Finance and Public Credit (SHCP) establishes the attributions of each Ministry of the Federal Government, rules the collection of these taxes. This law also determines the allocation criteria for the Federal Taxes, establishing that 20% of the Participatory Fund (created by the collection of federal taxes) goes to the States under the name of Federal Participation to States. This participation is the main source of income for the States from which they fund their own expenditure

including expenditures on education. Thus, State Expenditures on Education are financed by the resources that each State receives from the federal taxes in form of Federal Participation and by the funds different from the Federal Participation that States can raise.

EDUCATIONAL FINANCING

State Expenditures

The decentralization process needed for both levels of government (state and federal) be responsible for the educational financing. This meant that states had to increase the use of their own resources because their expenditure was much smaller than the Federal expenditures. The proportions that the two levels of government had to contribute for financing education, however, were undefined. This leads in different degrees of effort by the state government to increase state expenditures on education. Another problem is that states do not have a clear and consistent classification of the funds they use on education. There is also insufficient information about state spending on each level. Although some states have increased their expenditures on education, most expenditures goes to the payroll, and there are still many states that have not increased their own participation, depending on a higher degree of the federal transfers and participation. As much as this effort grows, states would be able to spend more money on specific programs in order to increase the quality and coverage of education, depending to a lesser extent on the Federal Government.

Federal Expenditure

The organization and administration of federal expenditures on education has changed recently, as a result of the 1998 reforms in the Law of Fiscal Coordination. In this reform, the ramo 33 was created to complement the new official policy for a new federalism. Starting from the assumption that the State Government is more efficient in the provision of some services (including educational services and the significance of improving the provision of these services), the SHCP organized a new scheme on how to finance these sectors.

Before reform, the Federal Government channeled the resources for education to the states through ramo 25 (Contributions to Basic Education) and ramo 26 (Previsions for Salaries). The ramo 11 is the channel to transfer funds for the maintenance of SEP and has not been changed. With the creation of ramo 33 in 1998, federal expenditure on education became part of a package of resources intended for education, health

services and infrastructure.

Reform and Allocation Criteria

The 1998 reform established new funds under ramo 33 that worked as institutional transfer channels. These funds are:

Basic Education Contributions Fund; Health Service Fund; Social Infrastructure Fund; Fund for the Strengthening of the Municipalities; and Multiple Contributions Fund.

The Basic Education Contribution Fund (ramo 33) now includes ramo 25 and ramo 26. Since the resources are labeled, they cannot be used for any other purposes than education. This is one of the main features of the reform: it gives the states more power for the supervision of the use of resources. According to the Project of Expenditures Budget of SHCP, at present, the states' legislatures have the responsibility of supervising the pertinence, efficiency and transparency of the use of Education resources. The Basic Education Contributions Fund, (FAEB) is negotiated annually by each state with SEP.

The basis for these negotiations consists in two criteria:

- Irreducible Expenditure: This part is based on the number of students, teachers and schools that each state has at the beginning of an academic year. According to this number, SEP establishes a certain amount that can maintain the functions of the whole state educational system including some resources for general services, materials and personal services.
- New necessities: Near the end of the academic year, each state negotiates more funding with SEP in order to cover the new necessities created by an increased demand for educational services or by the increased offer of teachers for the following academic year. Here, states can ask for more resources if they want to implement a specific program. Only states that satisfy SEP criteria for the creation of new locations will receive the necessary increment of resources. These criteria are established in the Booklet of Detailed Programming (*Manual de Programacion Detallada*) for the pre-school, primary and lower secondary levels.

After receiving each state's proposal, the SEP analyzes the increment viability in federal transfers for education, then sends its Expenditure Budget Proposal to the SHCP, which is the last opportunity for government denial or approval.

There are some resources that might be used for education but are not part of ramo 33. These resources are classified under different items and most are still administered by the federal government:

1. The Fund for the Administrator Committee of the Federal Program of Schools Construction (CAPFCE).
2. The National Council for the Educational Promotion (CONAFE).
3. Compensatory Resources under programs as PARE, PRODEI, etc.
4. Resources from other agencies as SEDESOL and DIF.

In the case of the CAPFCE, a new process of decentralization has been taking place since 1998. The committee has been transferring funds to states and municipalities so that they can be responsible for the construction, rehabilitation and maintenance of schools in pre-school and lower secondary. The responsibility for primary schools is already the competence of the state governments, and the idea is to gradually transfer it to all levels of education.

The decentralization process is distantly incomplete, since there are states with two organisms taking care of the educational system with duplicity of functions. This situation implicates a fiscal cost that is beyond the scope of this study, but which future research should analyze. To facilitate the administration and provision of the services as well as the collection of educational statistics and the integration of policies, it is desirable to have a single agency that directs the educational system. A unique agency in each state could make the educational supervision an easier task as long as the attributions of this organism are well defined. The efficiency of this organism largely depends on adequate use of resources. The latest reforms in the allocation of funds tend to prevent their misallocation, which themselves are not sufficient.

Another dimension in which the performance of the states is crucial for the well functioning of the transmission is the ability to raise funds from other sources (private investment or savings) generated from the correct administration of funds. If states depend largely on resources transferred by the federal government, it would be harder for them to allocate increasing resources to areas or programs different from the payroll. States have to avoid this situation to be able to fund specific projects to improve the quality of educational

services, developed by them, according to their own necessities. To this extent, the states would become really autonomous—otherwise decentralization would be merely administrative.

The Booklet of Detailed Programming describes some general guidelines based on two characteristics—increase of coverage and consolidation of service.

The first of these categories, the coverage increase, ultimately depends on the increase of demand for education in the localities in which further funding is required. Each state, city or locality that claims the need for more educational resources must justify requests for money. Under the first of these categories, the requirements that localities have to fulfill in the pre-school level are the following:

- There should exist an educational service at the primary level but not at the pre-school level.
- There should be enough demand for establishing a pre-school.
- There should be a need for an increase in the teaching of Spanish to indigenous people.

The second category, consolidation of service, refers to the analysis of the workplace when the student-teacher ratio justifies the increase or reallocation of teachers and principals. When localities present the following justifications, then they are eligible to receive more resources:

- Workplaces where teachers are not servicing the number of students established in the parameters.
- Schools where teaching, administrative and directive staff does not correspond with the staff authorized by the "Direccion General de Personal."

At the primary level, the eligible localities for receiving more funding according to the first category are:

- Regions without the primary educational services or with suspended services.
- Regions that have experienced demographic growth, which would justify the change from a community service to a formal primary service.
- Indigenous villages that need the service according to established parameters.

According to the second category, consolidation of service at the primary level makes eligible those work centers with one, two or three teachers, incomplete organization, and demand increases. The schools that fall in this category are those with:

- One, two or three teachers where academic burden requires an additional teacher.
- Incomplete organization and where the academic burden, through the application of established parameters, makes allowances for a large number of grades.
- Complete organization with a larger number of groups, and teachers in a previous grade that justify the need of one more teacher.

The same two categories exist at the lower secondary level. Increase of coverage is related to demand analysis. Localities allowing greater attention to potential students for this specific level are the most likely to receive the additional funds. These localities should have:

- Primary educational service and the necessary number of students for the installation of a lower secondary school.
- Potential growth of working groups that justify the expansion of first grade groups.
- Saturation of the Morning Schedule that justifies the creation of an Evening Service.
- Population growth that requires the creation of new educational center.

Eligibility in the category of service locality consolidation accords with the following criteria:

- Localities where a natural promotion from first to second and from second to third grades justifies increase of working groups and support staff.
- Localities where teachers and administrative staff do not correspond to the staff authorized by the General Direction of Human Resources and Labor Relationships, SEP.

Each level has its own parameters regarding the distribution of students and teachers. The parameters are presented in the next table:

PARAMETERS FOR PRE-SCHOOL LEVEL

- One community instructor should attend localities with less than 20 students.
- From 20 to 119 students the ratio students/teacher should be 20 to 29 students per teacher.
- From 120 to 244 students, the ratio should be 30 to 34 students per teacher.

- In localities with more than 245 students, the ratio should be 35 to 45 students per teacher.
- In indigenous localities with 15 to 99 students, the ratio should be 15 to 19 students per promoter (equivalent of a teacher for those communities).
- In indigenous localities with 100 to 174 students, the ratio should be 20 to 24 students per promoter.
- In indigenous localities with more than 175 students, the ratio should be 25 students per promoter.

PARAMETERS FOR PRIMARY LEVEL

- From 30 to 50 students: One teacher.
- From 50 to 80 students: Two teachers.
- From 80 to 135 students: Three teachers.
- From 135 to 180 students: Four teachers.
- From 180 to 225 students: Five teachers.

PARAMETERS FOR LOWER SECONDARY LEVEL

- Tele lower-secondary: Morning Service, 30 to 45 students per group.
- General lower secondary: Morning Service, 30 to 50 students per group.
- General lower secondary: Evening Service, 30 to 45 students per group.
- Lower secondary for Workers: Night Service, 29 to 42 students per group.
- Industrial Technical lower secondary: Morning Service, 30 to 50 students per group.
- Industrial Technical lower secondary: Evening Service, 30 to 45 students per group.
- Agricultural Technical lower secondary: Morning Service, 29 to 47 students per group.
- Agricultural Technical lower secondary: Evening Service, 29 to 47 students per group.
- Fishing Technical lower secondary: Morning Service, 29 to 47 students per group.
- Technical lower secondary: Evening Service, 29 to 45 students per group.
- Forest Technical lower secondary: Morning Service, 29 to 46 students per group.
- Forest Technical lower secondary: Evening Service, 30 to 57 students per group.

APPENDIX II

1. THE DATA

The Primary Education Assessment Survey, second round 1997 (*Evaluación de Educación Primaria, segundo levantamiento* 1997), from The Ministry of Education (SEP) is representative of state level and by stratum (urban {public and private} schools; public rural schools; indigenous schools and community schools). Tables 1 and 2 show the sample size by state and stratum.

Table 1. Number of Students by State and Stratum, Second Round 1997.

State	Community Schools	Indigenous Schools	Public rural school	Public urban school	Private urban school	Total
AGUASCALIENTES	4		452	746	120	1,322
BAJA CALIFORNIA		74	432	842	84	1,432
BAJA CALIFORNIA SUR	4		386	792	78	1,260
CAMPECHE	9	166	487	707	89	1,458
CHIAPAS	49	125	379	391	92	1,036
CHIHUAHUA	12	37	379	907	100	1,435
COAHUILA	14		718	2,155	732	3,619
COLIMA			444	653	124	1,221
DISTRITO FEDERAL				3,756	676	4,432
DURANGO	31	197	489	485	88	1,290
EDO. MEXICO	16	99	433	878	62	1,488
GUANAJUATO	20		483	613	51	1,167
GUERRERO	59	105	643	447	76	1,330
HIDALGO	44	143	488	489	91	1,255
JALISCO	42	289	388	797	108	1,624
MICHOACAN	69	399	384	558	95	1,505
MORELOS	15	48	420	927	64	1,474
NAYARIT	6	14	441	679	81	1,221
NUEVO LEON	6		411	939	104	1,460
OAXACA	34	448	709	516	64	1,771
PUEBLA	20	401	432	473	96	1,422
QUERETARO	18	52	504	500	138	1,212
QUINTANA ROO	5	45	385	809	85	1,329
SAN LUIS POTOSI	35	444	464	497	90	1,530
SINALOA	20	16	415	643	103	1,197
SONORA	2	412	345	773	477	2,009
TABASCO	20	409	544	484	71	1,528
TAMAULIPAS	12		394	787	73	1,266
TLAXCALA	6		533	604	79	1,222
VERACRUZ	45	800	1,867	2,083	66	4,861
YUCATAN	10	400	409	830	74	1,723
ZACATECAS	11		484	517	98	1,110
Total	638	5123	15742	27277	4429	53,209

Source: Primary Education Assessment Survey, second round SEP, 1997

Table 2. Number of Schools by State and Stratum, Second Round, 1997.

State	Community Schools	Indigenous Schools	Public rural school	Public urban school	Private urban school	Total
AGUASCALIENTES	2		25	29	7	63
BAJA CALIFORNIA		4	24	38	5	71
BAJA CALIFORNIA SUR	2		46	32	5	85
CAMPECHE	4	24	50	29	4	111
CHIAPAS	21	14	31	18	4	88
CHIHUAHUA	6	3	60	37	5	111
COAHUILA	6		82	89	32	209
COLIMA			32	28	5	65
DISTRITO FEDERAL				157	36	193
DURANGO	18	42	59	21	3	143
EDO. MEXICO	6	4	31	37	6	84
GUANAJUATO	11		28	26	3	68
GUERRERO	23	8	41	27	4	103
HIDALGO	17	15	41	20	5	98
JALISCO	16	34	48	35	8	141
MICHOACAN	35	27	36	23	4	125
MORELOS	4	2	24	39	5	74
NAYARIT	3	3	37	27	4	74
NUEVO LEON	3		57	41	5	106
OAXACA	16	37	50	22	4	129
PUEBLA	8	33	30	19	6	96
QUERETARO	7	7	31	20	5	70
QUINTANA ROO	2	9	28	35	4	78
SAN LUIS POTOSI	21	51	45	21	5	143
SINALOA	14	2	42	26	4	88
SONORA	2	73	38	34	23	170
TABASCO	8	37	39	20	3	107
TAMAULIPAS	8		38	32	4	82
TLAXCALA	3		26	25	3	57
VERACRUZ	20	81	201	113	4	419
YUCATAN	5	44	30	36	4	119
ZACATECAS	6		44	21	4	75
Total	297	554	1,394	1,177	223	3,645

Source: Primary Education Assessment Survey, second round. SEP, 1997

Stage 1: Student's characteristics Self-selection problem. The Probit estimation results are as follows,

```
Probit estimates                                  Number of obs   =      52571
                                                  Wald chi2(5)    =    3650.62
                                                  Prob > chi2     =     0.0000
Log likelihood =  -12216.36                       Pseudo R2       =     0.2888
------------------------------------------------------------------
                          |
   prob1                  |      Coef.      z     P>|z|
--------------------------+---------------------------
State (Trigger variables) |  All relevant dummies were significant
Stratum 2                 |  -.8827347  -26.466   0.000
Stratum 3                 |  -.3403305  -13.440   0.000
Stratum 5                 |  -.1263167   -3.169   0.002
C.R. size                 |   .0400382   22.891   0.000
Constant                  |   2.700305   47.287   0.000
------------------------------------------------------------------
```

Stage 2: Parents' characteristics Self-selection problem. The probit estimation results are as follows,

```
Probit estimates                                  Number of obs   =      43615
                                                  Wald chi2(11)   =    1618.34
                                                  Prob > chi2     =     0.0000
Log likelihood = -19051.299                       Pseudo R2       =     0.0497
------------------------------------------------------------------
                          |               Robust
   prob2                  |      Coef.       z     P>|z|
--------------------------+---------------------------
State (Trigger variables) |  All relevant dummies were significant
Stratum 1                 |   .6878342     7.451   0.000
Stratum 3                 |   .7453377   .10.984   0.000
Stratum 4                 |   .3772254   .14.357   0.000
Stratum 5                 |   .0963005   . 2.649   0.008
C.R. Size                 |    .007563   . 3.838   0.000
Stud. Gender              |   .0237731   . 1.106   0.269
Stud. Age                 |   -.030966    -2.394   0.017
HH size                   |  -.0224988   .-2.729   0.006
Stud. Preprim             |   .0617427   . 2.027   0.043
Stud. Likes Sch.          |  -.0105957   .-1.113   0.266
Constant                  |   .1596458   . 1.893   0.058
------------------------------------------------------------------
```

Stage 3: Teacher's characteristics Self-selection problem. The probit estimation results are as follows,

```
Probit estimates                                  Number of obs   =      38642
                                                  Wald chi2(25)   =    1589.93
                                                  Prob > chi2     =     0.0000
Log likelihood = -23498.156                       Pseudo R2       =     0.0533
------------------------------------------------------------------
          |
   prob3  |                      Coef.      z     P>|z|
---------+--------------------------------------------------------
State (Trigger variables)|  All relevant dummies were significant
Stratum 2                |   .3109471     5.975   0.000
Stratum 3                |   .0773937     2.897   0.004
Stratum 5                |  -.1863633    -5.340   0.000
Classroom size           |   .0150317     7.735   0.000
Student Gender           |  -.0266508    -1.305   0.192
Student Age              |  -.0347406    -2.943   0.003
HH size                  |  -.0152332    -2.072   0.038
Student's Preprimary Educ|   .0148598     0.511   0.610
Student's Likes school   |  -.0130222    -1.441   0.150
School's Area            |   .0148403     2.536   0.011
Schools' Director Educat.|  -.0093204    -1.449   0.147
School's Material 2      |  -.0923364    -1.979   0.048
School's Material 3      |   .1020397     4.215   0.000
School's Material 4      |   .2441283     9.457   0.000
------------------------------------------------------------------
```

Carrera Magisterial Self Selection Problem

Carrera Magisterial self-selection problem. The probit equation results are as follows,

```
Probit estimates                                  Number of obs   =      22040
                                                  Wald chi2(37)   =    2669.65
                                                  Prob > chi2     =     0.0000
Log likelihood = -11540.659                       Pseudo R2       =     0.1724
------------------------------------------------------------------------------------------
                                  Robust
  carmag                    Coef.   Std. Err.       z     P>|z|         dF/dX
-----------------------+------------------------------------------------------------------
State                    |   All relevant dummies were significant
Stratum 2                |  -.7613951   .0597008    -12.754   0.000      .3706374
Stratum 3                |  -.1237808   .0312558     -3.960   0.000      .3876072
Classroom size           |   .0130532    .002017      6.472   0.000      .0017506
Teacher gender (Male=1)  |   -.446673   .0293384    -15.225   0.000      -.1419307
Teacher age              |     .19615    .011233     17.462   0.000      .0479354
Teacher's Schooling      |   .1297847   .0122191     10.621   0.000      .0313395
Codependents             |   .1178115   .0105022     11.218   0.000      .0291940
Experience in 5th grade  |   .1043082   .0086326     12.083   0.000      .0431934
Supervisor's visits      |   .1187639   .0119659      9.925   0.000      .0087112
Teacher's opinion C.M.   |   .1361276   .0190356      7.151   0.000      .0485315
(The Trigger Variable)   |
Constant                 |  -1.328442   .1141722    -11.635   0.000
------------------------------------------------------------------------------------------
```

2. VARIABLES' DEFINITIONS

NAME	DEFINITION IN THE QUESTIONNAIRE	VARIABLE DESCRIPTION	SCALE
Mathematics achievement	Score obtained in the math exam, which covers 5th grade topics.	The exam scores are re-scaled using the Rash model	0-100
Spanish achievement	Score obtained in the Spanish exam, which covers 5th grade topics.	The exam has six parts, reading comprehension, use of graphics, writing, language interpretation, literature and writing expression. The grade is given by the percentages of correct answers.	0-100
Student's Gender (Male)	Male student	Dummy	
Student's Age	Student's age	Continuous	10-13 years old
Repetition in 5th grade (Yes)	Whether the student repeated 5th grade	Dummy	
Pre-school education (Yes)	Whether the student attended preschool	Dummy	
Blurred Vision (Yes)	Does the student see what is on the blackboard?	Dummy	
Teacher's performance, (as perceived by the student)	Quantitative indicator of the teacher's performance in 5th grade from the student's point of view. This index was constructed through principal component analysis.	Continuous. This index includes variables such as Teacher's assistance; student's comprehension of what the teacher explains; Teacher's behavior when students ask questions; and, Does the teacher provide all answers to the student doubts?	0-100
Student's attitude towards learning	Quantitative Indicator of the student's attitude towards learning in 5th grade. This index was constructed through principal component analysis.	Continuous. This index includes variables such as time spent on homework, frequency of research tasks and homework, and, the use of additional books for assignments.	0-100
Household Size	Number of family members	Categorical	1-5
Household Income	Family income flows	Categorical	1-7
House utilities	Services in house.	Categorical. Categories were constructed using availability indicators of water, drainage, electricity, telephone, and combinations of these.	
Father's schooling level	Student's father schooling	Categorical	0-6

	level		
Mother's schooling level	Student’s mother schooling level	Categorical	0-6
Household head economic sector	Student’s household head economic sector	A set of dummies variables. Economic sectors are defined as Professional Services, Agriculture, Manufacturing, Commerce, Handicraft Sector, and Public Service Sector.	
Parents involvement in the student's homework	Who helps the student do her/his homework?	Categorical	0-3
Parents meet with the teacher (Yes)	Meeting with the teacher to talk about the student's learning performance	Dummy	
Parents meet with the Director (Yes)	Meeting with the Director to talk about the student's learning performance	Dummy	
Number of books in house	Number of books in house	Categorical	1-6
Amenities or facilities in house	House amenities or facilities, which include radio, washing machine, refrigerator, gas stove, and television. It is assumed that the impact of each one is the same .	Continuous	0-5
Number of rooms in house	Number of rooms in house	Continuous	1-5
Parent's expectations of the student's educational level achievement	Index of parent's expectations of the student's educational level achievement.	Categorical. This index includes 3 values: low, medium and high expectations.	1-3
Parent's opinion of educational services in school	Index of Parent's opinion of educational services in school	Categorical. This index includes 3 values: Non-Favorable, Neutral, and Favorable	1-3
Family's standard of living	Family's standard of living index.	Categorical. This index includes 3 values: low, medium, adequate standard of living.	1-3
Teacher's age	Teacher’s age	Categorical	1-8
Teacher's gender (male)	Teachers gender	Dummy	
Teacher's residence within the community (yes)	Place of Residence (within or outside the community)	Dummy	
Teacher's years of residence in the community	Year of residence in the community	Categorical	1-6

Teacher's schooling level	Teacher's schooling	Categorical. This variable includes 5 values: Lower Secondary, Preparatory level of teachers training, 3 years (*Normal Básica* 3 años), Preparatory level of teachers training, 4 years (*Normal Básica* 4 años), Tertiary level of teachers training (*Normal Superior)*, and Bachelor degree.	1-5
Attendance to updating courses (Yes)	Attendance to updating courses	Dummy	
Number of updating courses	Number of updating courses taken by the teacher	Continuous	0-5
Teacher's experience as primary teacher	Teacher's experience as primary teacher	Categorical	1-5
Type of post. Short term (Yes)	Type of post	Dummy	
More than one post (Yes)	More than one post	Dummy	
Teacher's income	Teacher's income	Categorical	1-5
Secondary Occupation (Yes)	Another activity	Dummy	
Classroom size	Number of students in the classroom in 5^{th} grade.	Categorical	1-6
Didactic material available to the teacher	Didactic material includes Maps; Biology Tools; Blackboard Geometry Tools; Spanish Dictionary; Reference Books and several reading material; etc. It is assumed that each didactic material has the same impact on the learning process.	Continuous	0-7
Teacher's performance index (as perceived by the own teacher)	Quantitative indicator of teacher's performance in 5^{th} grade from the teacher's point of view. This index was constructed through principal component analysis.	Continuous. This index includes variables such as Teacher's pedagogical behavior; Teacher's interest in students' learning, Teacher's adaptability given the learning results, Teacher fosters students to self-learning, number of meetings with parents of low achievement children, Teacher's ability to plan.	0-100
Teacher's pedagogical behavior	If the student gives the wrong answer, What is the teacher's pedagogical behavior?	Categorical	0-3

Teacher's interest in students' learning	How frequent does the teacher have talks with her/his students about learning progresses and difficulties.	Categorical	0-2
Number of supervisor's visits (as answered by the teacher)	Number of supervisor's visits	Categorical	1-4
Number of supervisor's visits (as answered by the Director)	Number of supervisor's visits	Categorical	0-5
Teacher's enrollment in *Carrera Magisterial* (Yes)	Enrolled in *Carrera Magisterial*	Dummy	
Teacher's years of enrollment in *Carrera Magisterial*	Years in *Carrera Magisterial*	Categorical	1-5
Carrera Magisterial Level	Level in which the teacher is enrolled in *Carrera Magisterial*	Categorical	1-4
Director's income	Director's income	Categorical	1-5
Director's Age	Director's Age	Categorical	1-8
Director's experience	Director's experience	Categorical	
School equipment	The schools have Maps, Computers, Scientific Models, Television, Videocassette Recorder, and Digital Projector. It is assumed that every teaching tool has the same impact on learning process.	Continuous	1-7

3. HIGH EFFECTIVE AND LOW EFFECTIVE SCHOOLS. QUINTILE ANALYSIS

Table 3. Teacher and School Characteristics by Quintile

Variable	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Teacher's performance, (as perceived by the student) *	0.68	0.70	0.70	0.72	0.73
Student's attitude towards learning *	0.52	0.52	0.50	0.50	0.49
Teacher's performance index (as perceived by the own teacher) *	0.81	0.81	0.79	0.80	0.79
Parent's expectations of the student's educational level achievement ***	0.28	0.33	0.37	0.42	0.48
Parent's opinion of educational services in school ***	0.47	0.44	0.45	0.47	0.53
Teacher's gender (male) **	0.70	0.59	0.56	0.51	0.35
Teacher's Age ***	4.18	4.52	4.76	4.78	5.04
Teacher's residence within the community (yes) *	0.32	0.28	0.44	0.42	0.49
Teacher's years of residence in the community ***	5.08	5.15	5.40	5.42	5.45
Teacher's schooling level ***	3.32	3.68	3.56	3.57	3.70
Attendance to updating courses (Yes) **	0.46	0.53	0.44	0.47	0.50
Number of updating courses ***	2.73	2.84	2.40	2.93	3.13
Teacher's experience as primary teacher ***	4.36	4.57	4.88	4.77	4.84
Type of post. Short term (Yes) *	0.12	0.04	0.05	0.06	0.03
Teacher's pedagogical behavior ***	0.92	0.93	1.09	1.11	1.03
Teacher's interest in students' learning ***	1.71	1.65	1.65	1.64	1.66
More than one post (Yes) **	0.10	0.15	0.29	0.24	0.23
Secondary Occupation (Yes) **	0.12	0.22	0.10	0.12	0.14
Classroom size	20.17	22.94	22.55	23.13	23.34
Teacher's income ***	3.07	3.50	3.48	3.47	3.71
Didactic material available to the teacher	5.84	8.45	6.69	7.81	9.74
Number of supervisor's visits (as teacher's answer) ***	1.52	1.51	1.43	1.29	1.23
Teacher's enrollment in *Carrera Magisterial* (Yes) **	0.24	0.31	0.32	0.35	0.35
Carrera Magisterial Level **	0.34	0.41	0.41	0.47	0.47
Mean(dr28) ***	1.09	1.54	2.00	2.38	2.39
Number of supervisor's visits (as Director's answer) ***	1.68	1.61	1.25	0.83	1.12
Number of meetings with parents from children with low achievement level ***	0.73	0.69	0.65	0.66	0.69
Parent's involvement ***	1.60	1.75	1.79	2.00	2.12
Director's income***	3.48	3.75	4.05	4.32	4.37
Director's Age ***	5.21	5.56	5.95	6.21	6.12
Director's experience ***	3.81	3.66	4.11	4.20	4.02
School equipment ***	1.54	1.68	1.97	2.27	2.80

Source: Primary Education Assessment Survey, second round 1997, Sep.

Note: * Index from 0 to 1; ** Share; and, *** Categorical variable.

Table 4a. Teacher and School characteristics by Quintile and Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Teacher's performance, (as perceived by the student) *					
Community Schools	0.72	0.69	0.70	0.64	0.70
Indigenous Schools	0.67	0.68	0.67	0.70	0.64
Public rural school	0.68	0.69	0.70	0.72	0.71
Public urban school	0.71	0.71	0.71	0.72	0.75
Private urban school	0.71	0.69	0.64	0.74	0.73
Parent's expectations of the student's educational level achievement * **					
Community Schools	0.23	0.17	0.23	0.34	0.20
Indigenous Schools	0.29	0.32	0.26	0.33	0.22
Public rural school	0.27	0.32	0.33	0.35	0.34
Public urban school	0.36	0.38	0.43	0.46	0.53
Private urban school	0.40	0.55	0.47	0.57	0.65
Parent's opinion of educational services in school * **					
Community Schools	0.43	0.49	0.28	0.37	0.41
Indigenous Schools	0.52	0.50	0.47	0.44	0.46
Public rural school	0.45	0.43	0.46	0.49	0.49
Public urban school	0.47	0.45	0.44	0.45	0.52
Private urban school	0.62	0.50	0.57	0.61	0.61
Number of updating courses * **					
Community Schools	0.00	0.00	0.00	0.00	0.00
Indigenous Schools	2.99	3.42	2.24	2.61	0.93
Public rural school	2.81	2.97	2.43	3.17	2.89
Public urban school	2.80	2.31	2.57	2.88	3.62
Private urban school	0.19	4.63	0.64	2.55	3.03
Type of post. Short term (Yes) **					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	0.17	0.00	0.05	0.36	0.11
Public rural school	0.12	0.05	0.04	0.08	0.00
Public urban school	0.02	0.07	0.05	0.03	0.04
Private urban school	0.00	0.20	0.01	0.00	0.04
Secondary Occupation (Yes) **					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	0.12	0.52	0.04	0.06	0.17
Public rural school	0.12	0.15	0.10	0.10	0.20
Public urban school	0.18	0.12	0.11	0.11	0.11
Private urban school	0.45	1.00	0.03	0.26	0.13
Classroom size * **					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	4.07	5.65	4.58	4.51	2.39
Public rural school	4.10	4.46	4.49	4.52	4.74
Public urban school	5.12	5.09	5.12	5.37	5.45
Private urban school	1.91	1.80	5.36	4.96	5.07

Source: Primary Education Assessment Survey, second round 1997, Sep.

Note: * Index from 0 to 1; ** Share; and, *** Categorical variable.

Table 4b. Teacher and School characteristics by Quintile and Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Teacher's income ***					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	2.62	3.50	2.13	2.22	2.93
Public rural school	3.19	3.52	3.37	3.24	3.85
Public urban school	3.64	3.46	3.78	3.77	3.92
Private urban school	1.91	2.60	2.08	2.31	3.12
Didactic material available to the teacher ***					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	5.24	11.15	5.68	5.90	1.51
Public rural school	6.31	8.31	6.35	7.44	8.84
Public urban school	7.63	7.46	7.45	8.24	10.89
Private urban school	0.72	8.68	5.82	8.00	10.32
Teacher's enrollment in *Carrera Magisterial* (Yes) **					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	0.19	0.06	0.22	0.09	0.05
Public rural school	0.27	0.40	0.31	0.33	0.44
Public urban school	0.34	0.31	0.37	0.40	0.48
Private urban school	n.a.	n.a.	n.a.	n.a.	n.a.
Number of meetings with parents from children with low achievement level ***					
Community Schools	0.76	0.74	0.86	0.87	0.70
Indigenous Schools	0.75	0.71	0.67	0.74	0.70
Public rural school	0.73	0.73	0.65	0.66	0.72
Public urban school	0.65	0.59	0.63	0.65	0.70
Private urban school	0.07	0.79	0.72	0.71	0.63
Director's Income ***					
Indigenous Schools	2.96	2.33	3.22	3.40	2.69
Public rural school	3.62	4.02	4.02	4.39	4.46
Public urban school	4.17	4.20	4.26	4.41	4.34
Private urban school	3.84	3.94	2.22	3.47	4.40
School Equipment ***					
Community Schools	n.d.	n.d.	n.d.	n.d.	n.d.
Indigenous Schools	1.44	1.33	1.36	1.55	1.08
Public rural school	1.61	1.66	1.77	1.80	1.96
Public urban school	2.20	2.08	2.27	2.49	2.83
Private urban school	2.30	3.28	2.90	3.72	4.22

Source: Primary Education Assessment Survey, second round 1997, Sep.

Note: * Index from 0 to 1; ** Share; and, *** Categorical variable.

Table 5. Determinants of Mathematics Achievement Scores in 5th grade in Urban and Rural Areas

	Urban Areas			Rural Areas		
	Coeff.	**Level of Sig.**	**Elasticity**	**Coeff.**	**Level of Sig.**	**Elasticity**
Index	0.497	0.000		0.472	0.000	
Teacher's gender (Male)	-0.375	0.310	-0.003	0.754	0.568	0.0100
Teacher's age	0.350	0.055	0.036	-0.818	0.148	-0.0759
Attendance to updating courses (Yes)	0.522	0.401	0.009	-0.933	0.520	-0.0177
Teacher's residence within the community (Yes)	-0.714	0.065	-0.008	1.740	0.129	0.0099
Teacher's years of residence in the community (Yes)	0.019	0.876	0.002	0.573	0.084	0.0622
Teacher's schooling level	0.256	0.117	0.019	-0.483	0.246	-0.0365
Teacher's pedagogical behavior	0.238	0.001	0.005	0.018	0.048	0.0004
Teacher's interest in students' learning	0.451	0.035	0.015	0.509	0.032	0.0173
Number of updating courses	0.020	0.698	0.002	0.086	0.043	0.0093
Type of post. Short term (Yes)	-1.218	0.141	-0.001	5.766	0.040	0.0072
More than one post (Yes)	-0.046	0.895	0.000	4.153	0.026	0.0130
Teacher's income	0.059	0.655	0.004	-0.332	0.277	-0.0235
Didactic material available to the teacher	0.013	0.575	0.004	-0.224	0.003	-0.0626
Number of supervisor visits (as Director's answer)	5.237	0.000	0.045	dropped		
Teacher's enrollment in Carrera Magisterial (Yes)	0.032	0.947	0.000	2.797	0.005	0.0331
Carrera Magisterial level	-0.302	0.186	-0.006	-0.450	0.400	-0.0068
Correction of self-selection bias at stage 2	19.149	0.001		-1.931	0.849	
Correction of self-selection bias at stage 3	-20.915	0.000		-7.794	0.306	
Correction of self-selection bias in Carrera Magisterial	-0.420	0.764		-1.295	0.600	
Constant	48.219	0.000		56.266	0.000	

Source: Authors' estimates based on The Primary Education Assessment Survey, second round, SEP 1997.

Note: Figures in bold are significant at 5%.

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